TABLE 6

Release Rate of Fentanyl After Heat Stressing

% VA	Heat Stress	0-2 hr release (μg/cm^2·hr)	2-12 hr release (μg/cm^2·hr)	12-24 hr release (μg/cm^2·hr)
6.6	none	6.1	1.8	1.45
9	none	12.9	3.6	2.76
6.6 annealed	none	7.5	3.49	2.78
6.6 annealed	45°C, 16 hrs	27.4	6.4	3.8
6.6 annealed	45°C, 40 hrs	27.8	6.3	3.95
6.6 annealed	50°C, 4 hrs	22.1	5.75	3.85
6.6 annealed	50°C, 16 hrs	24.8	6.4	4.0
6.6 annealed	50°C, 24 hrs	27.3	6.26	3.59
9 annealed	50°C, 24 hrs	41.0	8.9	3.6

EXAMPLE 8

[00089] Tests were performed to observe annealing effects on water uptake of polyurethane membranes. Polyurethane membranes (blend of 65% Tecophilic® HP-60D-35 and 35% Tecoflex® EG-85A, Thermedics, Inc.) were heated at 52° C for 0, 4, 8, 16, 24, and 32 hours and thereafter weighed and stored in sealed bags at room temperature. The membranes were then placed in 15 ml of water at 37° C for 7 days, removed, and blotted dry to remove any surface water prior to weighing. Water uptake was calculated as: Water uptake (H_2O%) = (W_w / W_d)x 100 where W_w is the membrane weight after being removed from water and W_d is the dry membrane weight after the heat treatment. Fig. 10 shows the water uptake of annealed and non-annealed membranes as a function of time prior to testing. As seen in Fig.

10, the annealed membranes exhibited much more consistent water uptake values compared to non-annealed membranes. Figure 11 shows the water uptake as function of annealing time.

EXAMPLE 9

[00090] Tests were performed to observe annealing effects on water permeability of polyurethane membranes by measuring the weight gain of devices depicted in FIG. 4 incorporating annealed and non-annealed membranes. Two sets of polyurethane membrane plugs (Tecophilic® HP-60D-35, Thermedics, Inc.) were formed by injection molding. One set was annealed at 65° C for 24 hours and the other set was not subjected to annealing. One half of each set of the membranes were immediately fabricated into systems for weight gain testing (day 1) and the other half were stored for 28 days at which time systems were fabricated and tested for weight gain. The piston 34 and reservoir 32 were lightly lubricated with silicone medical fluid. The piston 34 was then inserted into the open end of chamber 36. Membrane plug 40 was then inserted by lining up the plug with the reservoir and gently pushing the plug until it was fully engaged in the reservoir. The system was then placed in a test medium (37° C deionized water) and the weight of the system was measured gravimetrically as a function of time. In order to prevent water from seeping into the formulation chamber through the orifice, the system was inserted into a form-fitting hole cut into the lid of a vacutainer such that the membrane end is enclosed in the vacutainer and the orifice end protrudes out of the container. The vacutainer was then filled with test medium which surrounded the membrane end of the system. The entire assembly was placed in a secondary vial which was sealed and placed in a 37° C water bath. System weight gain was measured by removing the system from the vacutainer, wiping it dry, weighing it, and then returning the system to the water bath filled vacutainer which was then

replaced in the heated water bath. The weight gain rate is calculated as $\Delta W / \Delta t = [W_{(i)} - W_{(i-1)}] / [t_{(i)} - t_{(i-1)}]$ where $W_{(i)}$ is the system weight at time $t_{(i)}$. The results are depicted in Figure 12.

EXAMPLE 10

[00091] Release rates from systems comprising annealed and non-annealed membranes were compared. Membranes were prepared and placed in systems according to Example 9. Half of each set of the membranes were immediately fabricated into systems and tested for release rate (day 1) and the other half were stored for 28 days at which time systems were fabricated and tested for release rate. The systems were filled with a blue dye solution consisting of 1-2% blue dye in 98-99% water. Testing was performed by placing dye filled systems in glass test-tubes filled with pre-warmed liquid (35 ml of distilled water or phosphate buffered saline solution). Periodic sampling was performed over 130 days by transferring the systems into fresh pre-filled, pre-warmed test-tubes and measuring the amount of dye in the old test-tubes.

[00092] The release rate was determined by measuring the absorbance of the surrounding release media using a spectrophotometer. Standard setting for blue dye is 630 nm and a standard curve for all formulations was prepared. Release rate (μl/day) was determined by comparing the absorbance of release media to the standard curve. The results are depicted in Figure 13.

EXAMPLE 11

[00093] The effect of annealing temperature and moisture content on water uptake of annealed membrane plugs was investigated. Polyurethane (HP-60D-35, HP-60D-20, Thermedics, Inc.) membrane plugs were formed by